wherein said first member is provided with a random uneven geometry on at least a part of its surface.--

REMARKS

This application has been reviewed in light of the Office Action dated May 7, 2002. Claims 1-84 and 86-94 are now presented for examination. Claim 85 has been canceled. New Claims 93 and 94 have been added to provide Applicants with a more complete scope of protection.[1] Claims 28, 29, 36, 46-48, and 86-92 have been amended to even further clarify the claimed subject matter. Claims 1, 26, 27, 43-51, 91, 93, and 94 are independent. Favorable reconsideration is requested.

Initially, the Examiner is sincerely thanked for the indication in the Office Action that Claims 1-27, 30-35, 37-45, 56-84, and 91 are allowed.

Claims 28, 29, 36, and 46-48 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly failing to particularly point out and distinctly claim the subject matter regarded as the invention. In particular, the Office Action states that there is no antecedent basis for the phrase "said first member" in those claims.

Without conceding the propriety of this rejection, Claims 28, 29, 36, and 46-48 have been amended to change "first member" to --spacer--, to even further ensure that those claims comply fully with the requirements of Section 112, second paragraph.

1/ Support for at least Claim 93 is found in the specification as originally filed, at least at page 60, lines 4-24.

Accordingly, it is believed that the rejection under Section 112, second paragraph, has been obviated, and its withdrawal therefore is respectfully requested.

Claims 85, 86, and 92 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,939,822 (Alderson). Claims 49-55 and 86-90 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Alderson, and Claims 89 and 90 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Alderson in view of U.S. Patent No. 5,760,538 (Mitsutake et al.).

Without conceding the propriety of the rejection of Claim 85, that claim has been canceled, thereby rendering its rejection moot.

Claim 91, which is indicated as allowed in the Office Action Summary, has been rewritten in independent form to incorporate the subject matter of former Claim 85, and to change "$0.05\mu m \leqq Rmax \leqq 10\mu m$" to --$0.05\mu m \leqq Rmax \leqq 100\mu m$--. Support for this latter change, which has not been made for purposes related to patentability, is found in the specification as originally filed, at least at page 61, lines 11-14.

The last paragraph on page 8 of the Office Action states that "the prior art of record neither teaches nor suggests an electron beam apparatus with all the claimed limitations particularly the height of the fine unevenness of the spacer-surface having a value in the range $.05\mu m \leqq R_{max} \leqq 10\mu m$." Although Claim 91 has been amended herein to change "10μm" to --100μm--, Applicants respectfully submit that the prior art of record also is not seen to teach or suggest a flat panel display apparatus having features as now recited in Claim 91, including a spacer having a surface, wherein a maximum height Rmax of a fine unevenness of the surface meets $0.05\mu m \leqq Rmax \leqq 100\mu m$. Accordingly, Claim 91 is believed allowable in its present form.

Claims 86-90 and 92 each have been amended to depend from independent Claim 91, and also are believed allowable, at least for the reason that each claim depends from an allowable base claim.

The rejection of independent Claims 49-51 will now be addressed.

Independent Claim 49 is directed to an electron beam apparatus comprising a hermetic container which includes an electron source having electron emission devices and targets exposed to the electrons emitted from the electron source, and further comprising a first member within the hermetic container. The first member is provided with an uneven geometry at least on a part of its surface, and the uneven geometry is arranged at least in two directions on the surface.

Independent Claim 50 is directed to an electron beam apparatus comprising a hermetic container which includes an electron source having electron emission devices and targets exposed to the electrons emitted from the electron source, and further comprising a first member within the hermetic container. The first member is provided with an uneven geometry at least on a part of its surface, the uneven geometry constituting of the amplitudes of at least two kinds of unevenness.

Independent Claim 51 recites an electron beam apparatus comprising a hermetic container which includes an electron source having electron emission devices and targets exposed to the electrons emitted from the electron source, and further comprising a first member within the hermetic container. The first member is provided with an uneven geometry at least on a part of its surface, the uneven geometry constituting of the cycles periods of at least two kinds of unevenness.

As described in the Amendment filed on November 5, 2001, an unevenness (fluting) on a spacer side surface is referred to at col. 7, line 27, through col. 8, line 20, of Alderson, and col. 7, lines 39-40, of that patent states that "[t]he fluting reduces secondary electron emissions in three ways." First, as described beginning from col. 7, line 42, "[a] number of these impinging electrons will strike the surface at oblique angles. . . . the flutings increase the probability that secondary electrons will impinge upon the surface at or nearly at right angles, reducing the number of secondary electrons emitted as a result of the impacts." Second, as described beginning at col. 7, line 51, "the alteration of the orientation of the surface of the support structure to the field lines of the electrostatic field allows the fluting to act as a trap for secondary electrons." Third, and as described at col. 8, lines 12-14, "the flutings act to reduce the number of hops a secondary electron and its progeny will make across the surface of the support structure toward the anode." Thus, according to Alderson, first there would be large number of electrons incident in an inclined direction relative to a side of the spacer, and the fluting is to set the electron incident direction vertical, thereby suppressing the secondary electron emission quantity. Second, since most of the emitted secondary electrons are directed again toward an anode, the secondary electrons are trapped within the fluting, thereby suppressing total secondary electron emission quantity. Third, repeated incidence of the secondary electron is suppressed, thereby reducing an avalanche multiplication of the secondary emission of the electron.

In support of the rejection of Claims 49-51, the Office Action asserts that (1) "it will be obvious [in view of Alderson] to one having ordinary skill in the art at the time of invention to specify the unevenness being arranged in two directions defining the

plane of the surface for better trapping of the secondary electrons", (2) "it is obvious to one having ordinary skill in the art at the time of invention to modify the amplitude of the fluting geometry of the first member of Alderson with at least two different amplitudes for reducing the secondary electron emission process", and (3) "it is obvious to one having ordinary skill in the art at the time of invention to modify the cycle period of the fluting geometry of the first member of Alderson with at least two different cycle periods corresponding two kinds of unevenness for reducing the secondary electron emission process." However, Applicants respectfully disagree with these allegations for the following reasons.

An important feature of the apparatus recited in Claim 49 is the first member is provided with an uneven geometry at least on a part of its surface, and the uneven geometry arranged at least in two directions on the surface.

As described from page 25, line 1 through page 26, line 20 of the originally-filed specification, one problem solved by the present invention is the need to suppress secondary electron emissions and charging of a spacer irradiated with electrons incident thereon from a variety of directions (see also page 28, lines 4-14). According to an aspect of the present invention to which Claim 49 relates, an uneven structure is formed in plural directions to suppress an increasing incident angle of electrons incident on the spacer surface, the electrons having a velocity component parallel with an electron source surface. As a result, secondary electron emissions are substantially suppressed (see, e.g., page 58, line 4, to page 59, line 22).

The attached Fig. B shows an example of one embodiment of a spacer having an uneven structure in plural directions, as viewed from a perspective looking from

a face plate side toward the spacer (i.e., Fig. B represents a sectional view taken along a plane parallel to the face plate and rear plate). According to an aspect of this invention, even when viewed from this perspective (i.e., in a direction normal to a face plate), the outer surface of the spacer can be seen as having an uneven geometry. As a result of the uneven geometry in plural directions, a reflection electrode from an anode, such as an emitted reflection electron having velocity components in the X and Y directions (indicated in the attached drawing sheet that includes Fig. B), has an incident angle reduced, to thereby suppress a secondary electron emission (see Fig. C).

According to Alderson, on the other hand, a spacer structure viewed from a perspective looking towards the structure from a face plate apparently would be as shown in attached Fig. A. As can be appreciated in view of Fig. A, the Alderson structure cannot provide the advantage of suppressing secondary emission of electrons emitted onto the spacer surface along the same path as reflection electrons. Moreover, in Applicants' view, Alderson is not seen to teach or suggest a variety of paths of electrons incident on a spacer, or a need to solve a problem wherein a spacer becomes charged as a result of electrons incident in a parallel direction. Indeed, nothing has been found, or pointed out, in Alderson, that would teach or suggest an electron beam apparatus comprising a first member with an uneven geometry at least on a part of its surface, wherein the uneven geometry is arranged at least in two directions on the surface, as recited in Claim 49.

An important feature of the apparatus recited in Claim 50 is that the first member is provided with an uneven geometry at least on a part of its surface, the uneven geometry constituting the amplitudes of at least two kinds of unevenness. An important feature recited in Claim 51 is that the first member is provided with an uneven geometry at

least on a part of its surface, the uneven geometry constituting of the cycles periods of at least two kinds of unevenness. By virtue of these features, undesired secondary electron emissions and charging of the spacer are suppressed. For example, referring to the attached Fig. E, by virtue of an uneven structure constituting plural amplitudes or periods, even in a case where electrons are incident on the spacer from a variety of angles, the effects of the incident angles are substantially suppressed and substantial re-trapping of secondary electron emission electrons is attained. The results obtained with each structure are substantially the same.

Even if Alderson be deemed to refer to forming a fluting as an uneven structure on a spacer, and even if the fluting be deemed to be of a round or rectangular structural variation, the uneven geometry is uniformly even. As a result, in cases where paths and incident angles of incident electrons may vary, the secondary electron emissions also would vary, thereby causing a variation in a charging state of the spacer and an associated instability in the performance characteristics of a display apparatus. Indeed, nothing has been found, or pointed out, in Alderson, that would teach or suggest an electron beam apparatus comprising a first member provided with an uneven geometry at least on a part of its surface, the uneven geometry constituting of the amplitudes of at least two kinds of unevenness, as recited in Claim 50, or an electron beam apparatus comprising a first member provided with an uneven geometry at least on a part of its surface, the uneven geometry constituting of the cycles periods of at least two kinds of unevenness, as recited in Claim 51.

Moreover, since, as described above, Alderson is not seen to teach or suggest a wide variety of paths of electrons incident on a spacer, and also is not seen to be

concerned with a need to solve a problem wherein a spacer becomes charged as a result of electrons incident in a parallel direction, there would have been no reason why one skilled in the art at the time of Applicants' invention would have even consulted Alderson, let alone been motivated to modify that reference "for better trapping of . . . secondary electrons" as proposed in the Office Action. Indeed, the Examiner's suggestion to modify Alderson seemingly constitutes improper hindsight reasoning, since it proposes to modify the reference to achieve a result (i.e., a solution to the problems confronted by Applicants' at the time of their invention) apparently gleaned solely from Applicants' disclosure, without any teaching, suggestion, or motivation in the prior art to do so. MPEP § 2142 (it is impermissible to resort to hindsight based on an applicant's disclosure; a legal conclusion of obviousness must be based on facts gleaned from the prior art).

For these reasons, and for the reason the Alderson is not seen to teach or suggest the above-emphasized features of Claims 49-51, Applicants respectfully submit that the Office Action has failed to establish a *prima facie* case of obviousness against Claims 49-51. "To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." MPEP § 2143.03 (citing *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)). "To establish *prima facie* obviousness, . . . there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings." MPEP § 2142.

Therefore, Claims 49-51 are believed clearly patentable over Alderson.

Added independent Claims 93 and 94 recite an electron beam apparatus which has features similar in at least some respects to those of Claim 49, except that the

first member recited in Claim 93 has an uneven geometry with a multiple cycle structure, and the first member recited in Claim 94 has a random uneven geometry on at least a part of its surface.

For reasons substantially similar to those set forth above, Applicants respectfully submit that Alderson is not seen to teach or suggest those features of Claims 93 and 94.

A review of the other art of record, including Mitsutake et al., has failed to reveal anything which, in Applicants' opinion, would remedy the deficiencies of the art discussed above, as a reference against the above-discussed independent claims herein. Those claims are therefore believed patentable over the art of record.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons as are those independent claims. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of the patentability of each on its own merits is respectfully requested.

This Amendment After Final Rejection is believed clearly to place this application in condition for allowance and its entry is therefore believed proper under 37 C.F.R. § 1.116. At the very least, it is believed that the cancellation of Claim 85 eliminates all issues relating to that claim. In any event, entry of this Amendment After Final Rejection, as an earnest effort to advance prosecution and reduce the number of issues, is respectfully requested. Should the Examiner believe that issues remain outstanding, the Examiner is respectfully requested to contact Applicants' undersigned attorney in an effort to resolve such issues and advance the case to issue.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,

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281773v1

Alderson

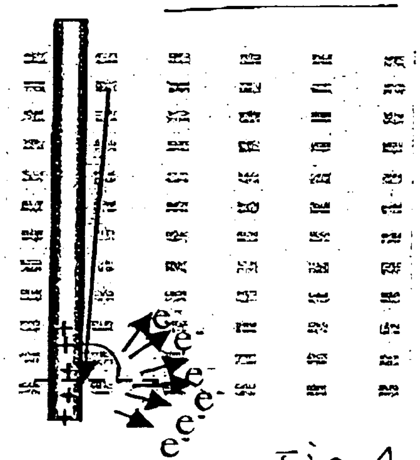
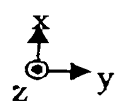


Fig. A



Present Invention

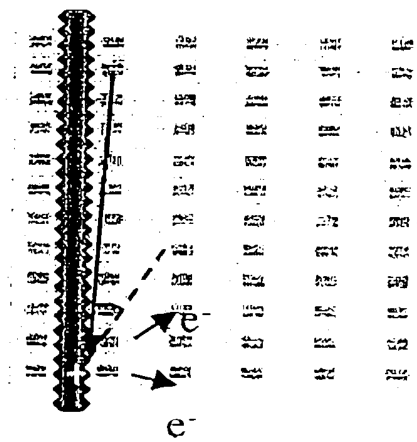
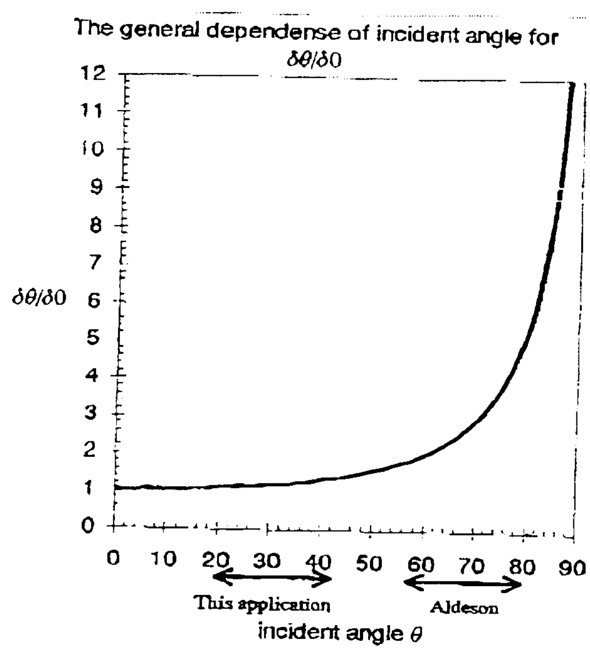


Fig. B



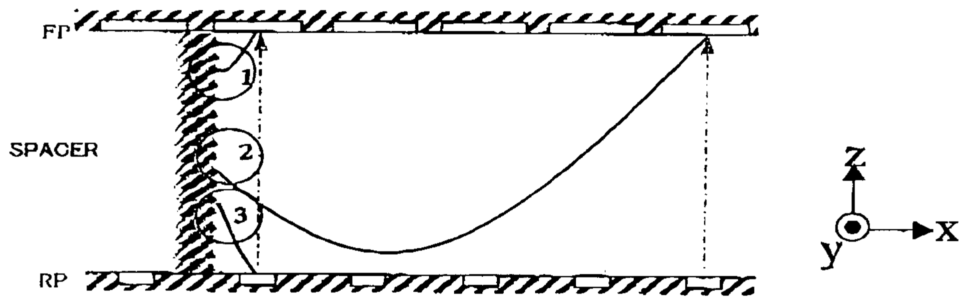
$$\frac{\delta\theta}{\delta 0}=\frac{1-\left\{1-\dfrac{m_0\cos\theta}{1+(m1)^{-1}\times(m_0\cos\theta)^{m2}}\right\}\exp(-m_0\cos\theta)}{1-\left\{1-\dfrac{m_0}{1+(m1)^{-1}\times m_0^{\,m2}}\right\}\exp(-m_0)}\times\frac{1}{\cos\theta}$$

$m1 = 0.68273, m2 = 0.86212$

Fig. C

Fig. D

Various electron orbits in vertical plane view



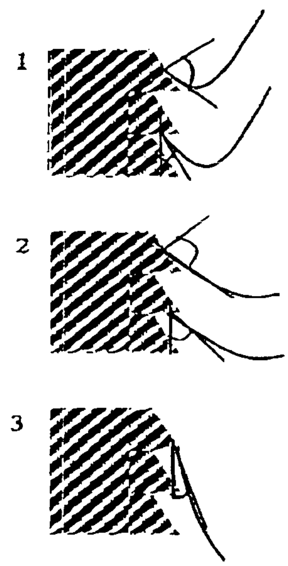
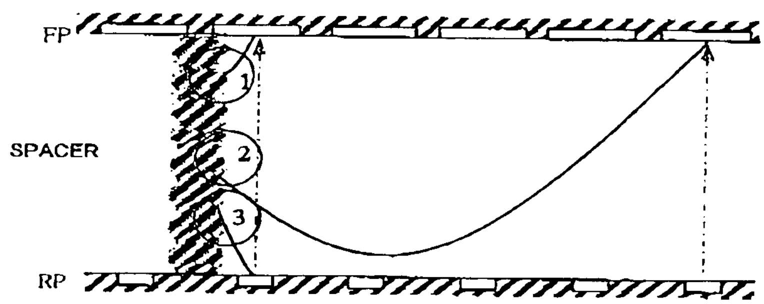


Fig. E-A

Various electron orbits in vertical plane view



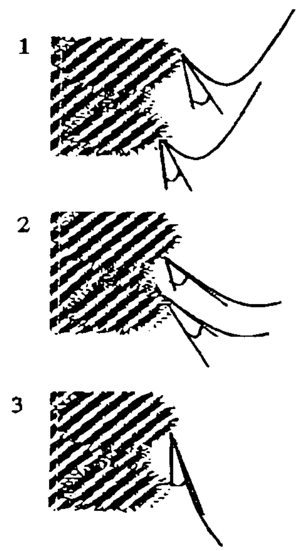
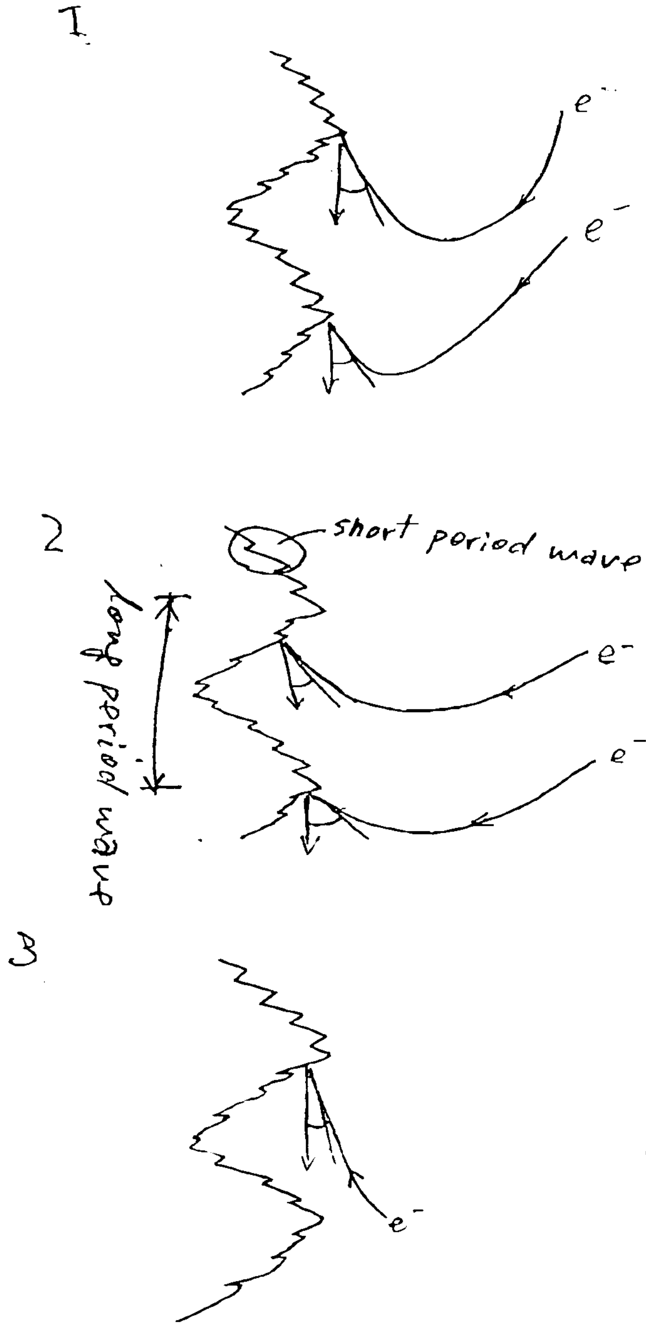


Fig. E-B

(Enlarged View of Fig. E-A)



NOTE

Incident electrons e⁻ of variety of incident angles are incident on a spacer surface waving (UNEVEN) such that short period wave is formed along long period wave

VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

28. (Amended) The spacer according to claim 27, wherein the incident angle multiplication coefficient of secondary electron emission coefficient m_0 on the surface of said [first member (on its surface)] spacer is 5 or less in the incident energy equal to or lower than said cross-point energy when obtaining it from the value of secondary electron emission coefficient measured under the conditions that incident energy is 1 keV and incident angle is 0 degree as well as the values measured under the conditions that incident energy is 1keV and incident angles θ are 20, 40, 60 and 80 degrees by conducting a regression analysis by the least square method in said general formula (1).

29. (Amended) The spacer according to claim 27 or claim 28, wherein said [first member] spacer is provided with an uneven geometry at least on a part of its surface.

[(The spacer according to claim 27 or claim 28, comprising an uneven geometry at least on a part of its surface.)]

36. (Amended) The spacer according to claim 27, comprising an uneven geometry at least on a part of its surface, said uneven geometry being obtained by removing the material surface of said [first member] spacer nonuniformly [(by removing its material surface nonuniformly)].

46. (Twice Amended) A spacer, wherein the value of the incident angle multiplication coefficient m_0 of secondary electron emission coefficient, which is a parameter of the following formula:

$$\frac{\delta_\theta}{\delta_0} = \frac{1 - \left\{1 - \dfrac{m_0 \cos\theta}{1 + (m_1)^{-1} \times (m_0 \cos\theta)^{m_2}}\right\} \exp(-m_0 \cos\theta)}{1 - \left\{1 - \dfrac{m_0}{1 + (m_1)^{-1} \times m_0^{\ m_2}}\right\} \exp(-m_0)} \times \frac{1}{\cos\theta}$$

General Formula (1)

is 10 or less,

when obtaining it from the value of secondary electron emission coefficient measured under the conditions that incident energy is 1 k eV and incident angle is 0 degree as well as the values measured under the conditions that incident energy is 1 k eV and incident angles θ are 20, 40, 60 and 80 degrees by conducting a regression analysis by the least square method in said general formula (1), provided that the second electron emission coefficient of its surface has two incident energies which satisfy the second electron emission coefficient $\delta = 1$ under the vertical incident conditions, and that when the larger energy of said two energies satisfying said condition $\delta = 1$ is referred to as a second cross-point energy, the secondary electron emission coefficients for the primary electrons whose incident angles are θ and 0 degrees are represented by

δ_θ, δ_0, respectively, and

m_1 , m_2 have the values

$m_1 = 0.68273$

$m_2 = 0.86212$, respectively,

in the incident energy equal to or lower than the second cross-point energy,

wherein said [first member] spacer is provided with an uneven geometry at least on a part of its surface, said uneven geometry being arranged at least in two directions on the surface.

47. (Twice Amended) A spacer, wherein the value of the incident angle multiplication coefficient m_0 of secondary electron emission coefficient, which is a parameter of the following formula:

$$\frac{\delta_\theta}{\delta_0} = \frac{1 - \left\{1 - \dfrac{m_0 \cos\theta}{1 + (m_1)^{-1} \times (m_0 \cos\theta)^{m_2}}\right\} \exp(-m_0 \cos\theta)}{1 - \left\{1 - \dfrac{m_0}{1 + (m_1)^{-1} \times m_0^{\,m_2}}\right\} \exp(-m_0)} \times \frac{1}{\cos\theta}$$

General Formula (1)

is 10 or less,

when obtaining it from the value of secondary electron emission coefficient measured under the conditions that incident energy is 1 k eV and incident angle is 0 degree as well as the values measured under the conditions that incident energy is 1 k eV and incident angles 0 are 20, 40, 60 and 80 degrees by conducting a regression analysis by the least square method in said general formula (1), provided that the second electron emission coefficient of its surface has two incident energies which satisfy the second electron emission coefficient

$\delta = 1$ under the vertical incident conditions, and that when the larger energy of said two energies satisfying said condition $\delta = 1$ is referred to as a second cross-point energy, the secondary electron emission coefficients for the primary electrons whose incident angles are θ and 0 degrees are represented by

δ_θ, δ_0, respectively, and

m_1, m_2 have the values

$m_1 = 0.68273$

$m_2 = 0.86212$, respectively,

in the incident energy equal to or lower than the second cross-point energy,

wherein said [first member] <u>spacer</u> is provided with an uneven geometry at least on a part of its surface, said uneven geometry constituting of the amplitudes of at least two kinds of unevenness.

48. (Twice Amended) A spacer, wherein the value of the incident angle multiplication coefficient m_0 of secondary electron emission coefficient, which is a parameter of the following formula:

$$\frac{\delta_\theta}{\delta_0} = \frac{1 - \left\{ 1 - \dfrac{m_0 \cos\theta}{1 + (m_1)^{1} \times (m_0 \cos\theta)^{m_2}} \right\} \exp(-m_0 \cos\theta)}{1 - \left\{ 1 - \dfrac{m_0}{1 + (m_1)^{1} \times m_0^{m_2}} \right\} \exp(-m_0)} \times \frac{1}{\cos\theta}$$

General Formula (1)

is 10 or less,

when obtaining it from the value of secondary electron emission coefficient measured under the conditions that incident energy is 1 k eV and incident angle is 0 degree as well as the values measured under the conditions that incident energy is 1 k eV and incident angles θ are 20, 40, 60 and 80 degrees by conducting a regression analysis by the least square method in said general formula (1), provided that the second electron emission coefficient of its surface has two incident energies which satisfy the second electron emission coefficient $\delta = 1$ under the vertical incident conditions, and that when the larger energy of said two energies satisfying said condition $\delta = 1$ is referred to as a second cross-point energy, the secondary electron emission coefficients for the primary electrons whose incident angles are θ and 0 degrees are represented by

δ_θ, δ_0, respectively, and

m_1 , m_2 have the values

$m_1 = 0.68273$

$m_2 = 0.86212$, respectively,

in the incident energy equal to or lower than the second cross-point energy,

wherein said [first member] spacer is provided with an uneven geometry at least on a part of its surface, said uneven geometry constituting of the cycles periods of at least two kinds of unevenness.

85. (Canceled)

86. (Amended) An apparatus according to claim [85] 91, wherein said spacer comprises an insulative spacer body and a high resistance film formed on a surface of said spacer body.

87. (Amended) An apparatus according to claim [85] 91, wherein said spacer has a structure comprising an insulative spacer body and a high resistance film formed on a surface of said spacer body, a fine unevenness is formed on the surface of said spacer body, and, based on the fine unevenness on the surface of said spacer body, a fine unevenness is formed on a surface of said high resistance film.

88. (Amended) An apparatus according to claim [85] 91, wherein said spacer has a structure comprising an insulative spacer body and a high resistance film formed on a surface of said spacer body, and a fine unevenness is formed on a surface of said high resistance film.

89. (Amended) An apparatus according to claim [85] 91, wherein said spacer has a surface resistance in a range of 10^7 - 14^{14} $\Omega/\square$

90. (Amended) An apparatus according to claim [85] 91, wherein said spacer has a structure comprising an insulative spacer body and a high resistance film formed on a

surface of said insulative spacer body, and said high resistance film has a surface resistance in a range of 10^{7} - $14^{14}\,\Omega$ /□.

91. (Amended) [An] A flat display apparatus [according to claim 85], comprising:

first and second substrates supported in opposition to each other, wherein a spacer having a predetermined height exists between said first and second substrates, a periphery of opposing sections of said first and second substrates are hermetically sealed to form a hermetic flat space between said first and second substrates, and an electron-emitting section is disposed at a side of said first substrate; and

a phosphor plane disposed at a side of said second substrate,

wherein an electron derived from said electron-emitting section is accelerated and irradiates onto said phosphor plane to cause an excited light emission from said phosphor plane, thereby performing a desired light emission displaying, and a surface of said spacer includes a fine unevenness, and

wherein a maximum height Rmax of the fine unevenness of the [fine uneven] surface meets $0.05\mu m \leq Rmax \leq$ [$10\mu m$] $100\mu m$.

92. (Amended) an apparatus according to claim [85] 91, wherein the fine uneven surface is formed at least a part of said spacer.

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